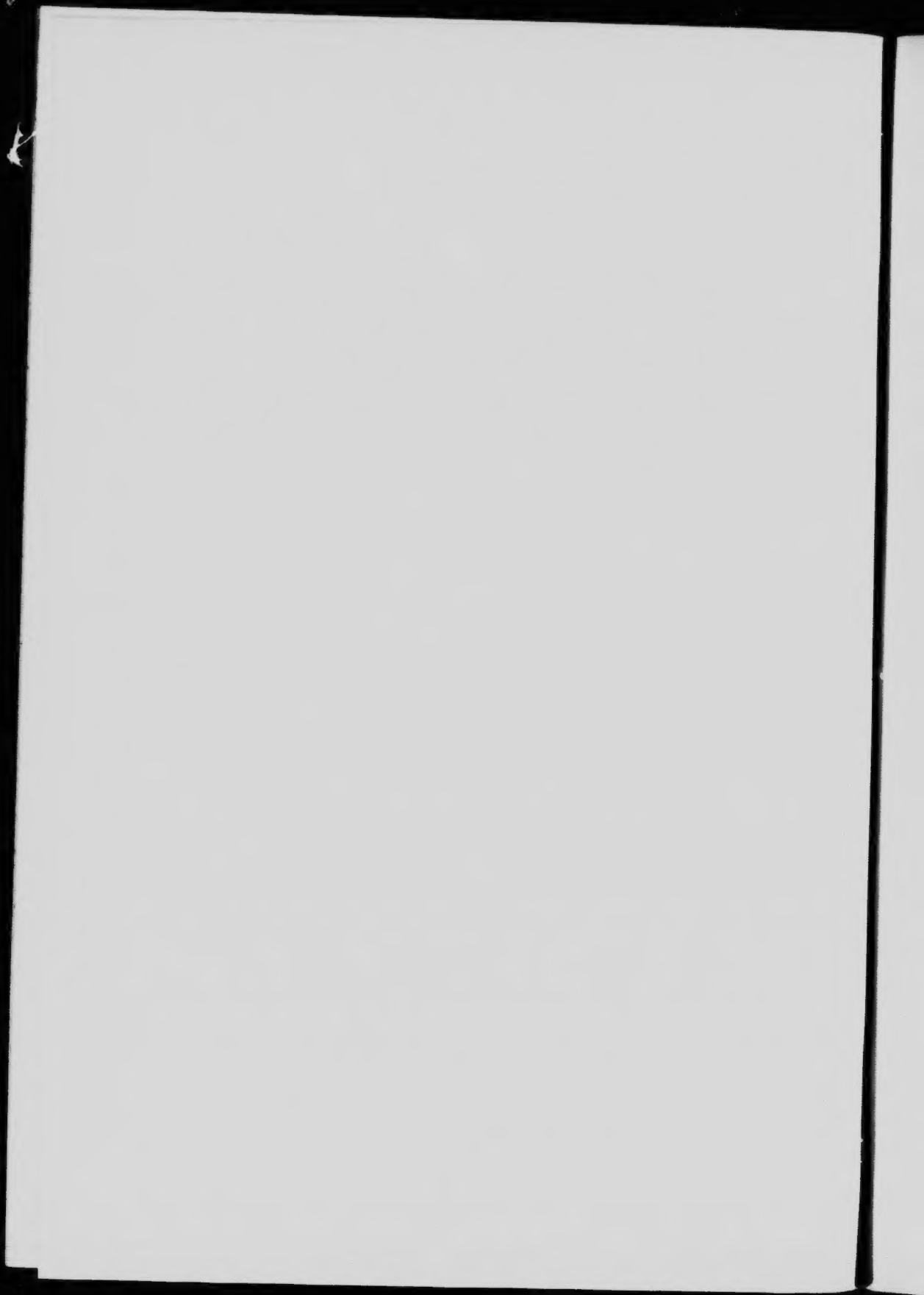




PROVINCE OF BRITISH COLUMBIA.

DEPARTMENT OF AGRICULTURE
(Live-stock Branch).

THE CONSTRUCTION OF SILOS.

BULLETIN No. 38.

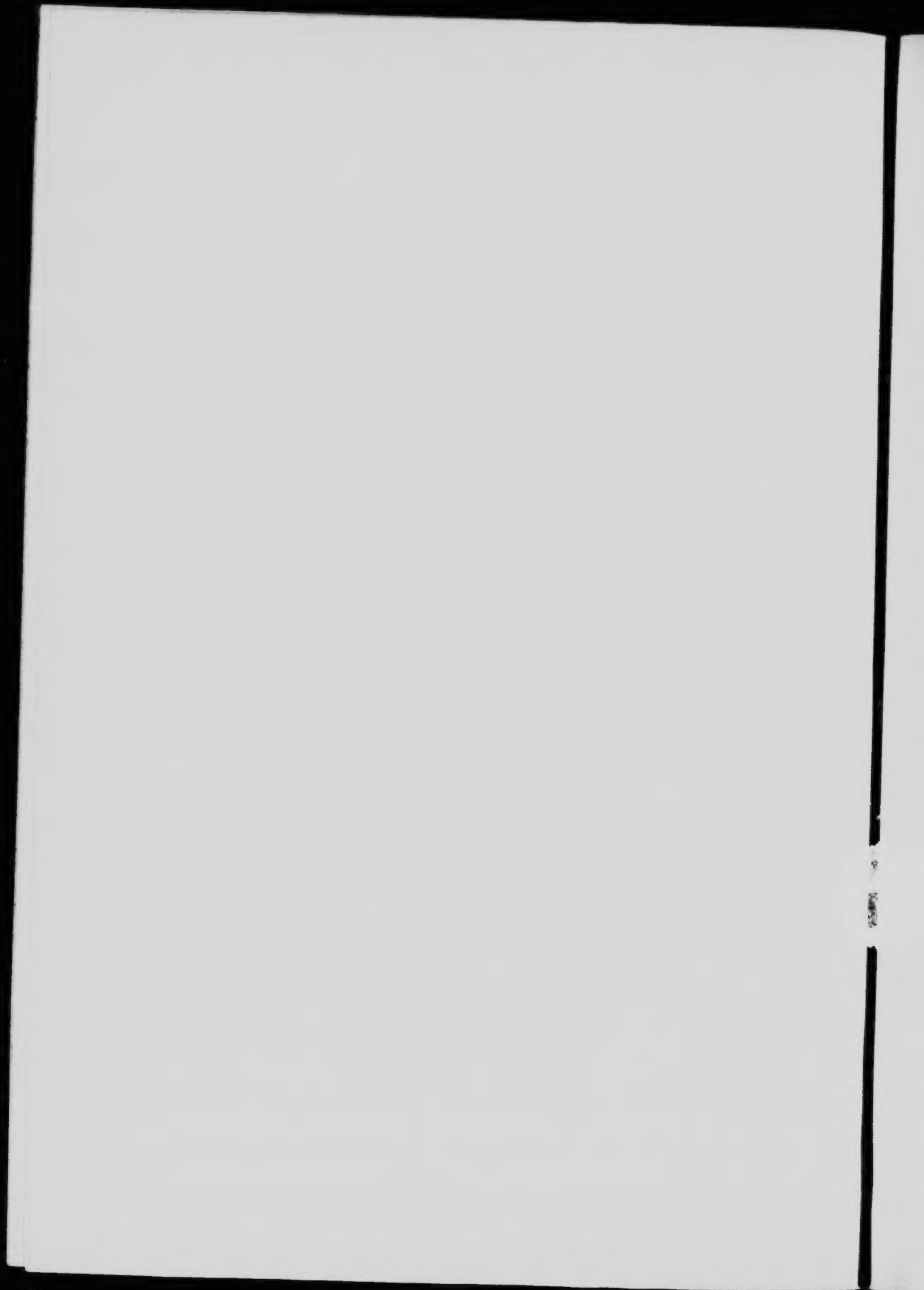


THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA.

**PRINTED BY AUTHORITY OF
THE LEGISLATIVE ASSEMBLY OF BRITISH COLUMBIA.**

VICTORIA B.C. :

Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
H. C.



PROVINCE OF BRITISH COLUMBIA.

DEPARTMENT OF AGRICULTURE (Live-stock Branch).

Minister of Agriculture.....	Hon. Price Ellison.
Deputy Minister of Agriculture.....	W. E. Scott.
Live-stock Commissioner.....	W. T. Macdonald, B.S.A., M.S.
Dairy Instructor.....	H. Rive, B.S.A.
Chief Poultry Instructor	J. R. Terry.
Poultry Instructor.....	H. E. Upton.
Chief Veterinary Inspector.....	A. Knight, V.S.
Veterinary Inspectors.....	{ S. A. K. White, V.S. W. W. Alton, V.S. B. R. Hilsley, V.S.
Secretary of the Department.....	A. E. Craddock.

The bulletins issued by the Department of Agriculture are sent free to all members of Farmers' Institutes.

DEPARTMENT OF AGRICULTURE,
VICTORIA, B.C., February 15th, 1912.

Hon. Price Ellison,

Minister of Agriculture.

SIR,—I have the honour to submit Bulletin No. 38, "Construction of Silos," as compiled by H. Rive, B.S.A., Provincial Dairy Instructor.

I have the honour to be,

Sir,

Your obedient servant,

WM. E. SCOTT,
Deputy Minister of Agriculture.

THE CONSTRUCTION OF SILOS.

By H. RIVE, B.S.A., PROVINCIAL DAIRY INSTRUCTOR.

GENERAL REQUIREMENTS.

(1.) *The Silo must be Air-tight.*—The manufacture of silage is a series of fermentation processes. The more air at the disposal of the bacteria, the further the fermentations will progress; and if their effects are too far-reaching, putrefactive bacteria continue the work of the acid-producing ones, and the result is rotten silage.

(2.) *The Silo must be Deep enough.*—Depth is essential in order to have the corn under good pressure, causing it to pack well and leave little air in the interstices between the cut fodder. The loss from spoiled silage in the case of deep silos is smaller than in that of shallower ones. In proportion to the amount stored, and as less surface is exposed the loss is also smaller while the silage is being fed.

(3.) *The Silo should have smooth Perpendicular Walls.*—This allows the mass to settle without forming cavities along the walls.

(4.) *The Silo must be built on Solid Ground.*—The weight of a silo and its contents being great, it must be placed on solid ground to avoid settling.

(5.) *The Walls should be Rigid and Strong.*—The outward pressure of cut corn when settling is considerable, and increases with the depth of the silage. In wooden silos, as the silage settles in the lower part, the outward pressure spreads the walls more than it does higher up, and may force them away from the silage, allowing air to enter.

LOCATION AND SIZE.

The location of a silo must have reference to the greatest possible facility in feeding. Where practicable, it should open into the feed-room, or at least be placed close to the barn and connected with the feed-room by a covered passage. Guard against odours in the barn from silage, or trouble will ensue. Have the bottom of the silo as nearly on a level with the stable-floor as possible, not more than a few feet below, for it is more economical to elevate the silage when filling the silo than to do so later.

The dimensions of the silo will depend on the number of cows requiring to be fed, and the length of time for which silage is needed. Variations occur in the requirements of cows, some having capacity for 40 lb. of silage per day, others for only 20 lb., making it difficult to state the exact size of silo suited to a given number of animals, unless knowledge of their daily wants is available. Ascertain the average amount to be fed each cow, whether 20, 30, or 40 lb. per day. Then make the diameter of the silo such that, by feeding the cows a full ration of so-much, the silage can be lowered at least 2 inches per day; and if there is occasion to diminish the ration, $1\frac{1}{2}$ inches daily may still be taken. Forty pounds of silage daily would require about 5 square feet of feeding surface in the silo.

TABLE FOR DETERMINING DIAMETERS.

No. of Cows to be fed.	Diameter of Silo required.
13	9
15	10
19	11
22	12
26	13
31	14
35	15
40	16

It is not advisable to build a silo more than 16 feet in diameter, and it is better to have two small silos than one too large.

The height above the foundation should be at least twice the inside diameter. The tons of silage required indicate the height, and they depend on the period for which food has to be provided. The average weight of a cubic foot of matured silage may be taken as 40 lb. One ton accordingly will take up 50 cubic feet, and 100 tons, 5,000 cubic feet. During six months, or 180 days, ten cows, each consuming 40 lb. daily, would require 36 tons of silage, which is contained in 1,800 cubic feet.

APPROXIMATE CAPACITY OF CYLINDRICAL SILOS FOR WELL-MATURED CORN SILAGE, IN TONS.

Depth of Silo, Feet.	Inside Diameter, Feet.				
	10	12	14	15	16
20	26	38	51	59	67
21	28	40	55	63	72
22	30	43	59	67	77
23	32	46	62	72	82
24	34	49	66	76	87
25	36	52	70	81	90
26	38	55	74	85	97
27	40	58	78	90	103
28	42	61	83	95	108
29	45	64	88	100	114
30	47	68	93	105	119
31	49	70	96	110	125
32	51	73	101	115	131

The foregoing figures refer to matured silage which has settled thoroughly. To obtain 30 feet of the silo must be about 34 or 35 feet high to allow for the settling. This process takes place more completely and the silage keeps better in silos 30 feet high than in shallower ones. The loss of food material that takes place in the manufacture of silage is from 5 to 10 per cent. If 90 tons be needed, it is therefore necessary to place about 100 tons of corn in the silo.

The following table shows how much silage is required to keep different numbers of cows for 180 days, feeding 40 lb. per day, and the dimensions of silos and area of land required to furnish the feed given. The capacity in tons is estimated after all shrinkage has occurred.

Dimensions.	Capacity in Tons.	Acres to fill, 15 Tons per Acre.	Cows it will keep for six Months, 40 lb. per Day.
10 x 20	28	3	8
12 x 20	40	3	11
12 x 24	48	3 $\frac{2}{3}$	13
12 x 28	60	4	15
14 x 22	61	4 $\frac{1}{3}$	17
14 x 24	67	4 $\frac{2}{3}$	19
14 x 28	83	5 $\frac{2}{3}$	23
14 x 30	93	6	25
16 x 24	87	6 $\frac{2}{3}$	24
16 x 26	97	7	26
16 x 30	110	8	30

If a silo be filled gradually with matured corn, and, after settling has taken place, filled again and again if necessary, it will hold far more than when filled rapidly and not refilled after settling.



(Fig. 1.) Monolithic Concrete Silo.

MATERIAL.

Many kinds of material have at different times been used in the construction of silos; among them, stone, cement, lumber, brick, tile, sheet iron, galvanized iron, etc. We need consider only cement and lumber, the two the most readily available throughout our Province, and everywhere the best suited to this purpose.

CONCRETE SILOS.

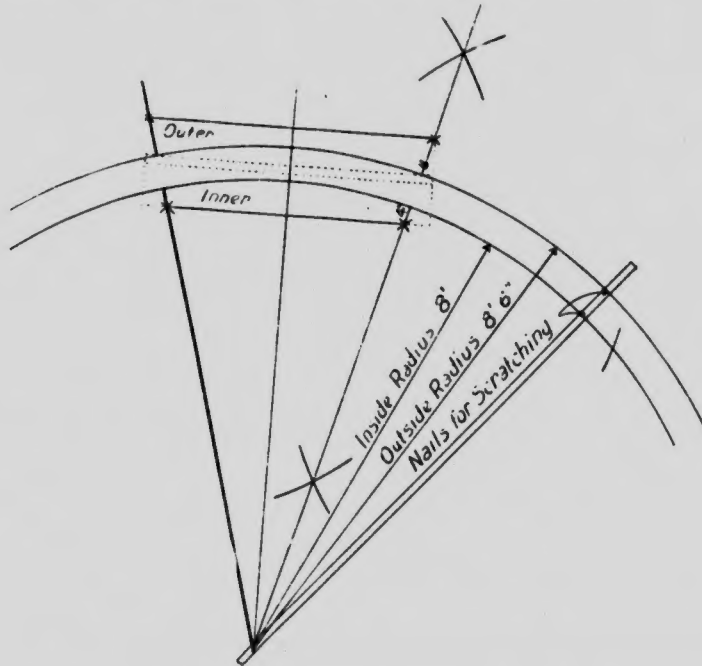
Concrete silos are of three types:—

- (1.) Monolithic or solid wall;
- (2.) Monolithic hollow wall;
- (3.) Concrete block.

Of these, the solid-wall concrete silo is the cheapest and most easily constructed, and will be dealt with herein. It was first built with very thick walls, without reinforcement. By means of reinforcement, bars, wire, or wire mesh embedded in the concrete, a much greater strength can be obtained with thinner walls. This effects a considerable saving in the quantity of cement used and in the cost of material and labour.

FORMS.

Clean a space on a barn-floor, then secure a long piece of 1-inch by 3-inch material. Nail one end to the floor, and from the centre of the nail measure out on the strip the exact distance of the radius of the silo to be built.



(Fig. 2.) Showing method of laying out forms.

Drive a nail through the strip here. If the wall is to be 6 inches thick measure from the centre of this nail 6 inches farther, and drive another nail through. Then scratch them along the floor to mark sections of two circles. Now take a fine wire, tie a pencil to one end, and measure it the exact length from the inside circle to the centre. Select any point on the inside curve, mark it, then strike a point on this same curve as far as the wire will reach from the point selected. This marks off a part of the circle equal to one-sixth of the circumference of the silo. Lay a straight board between the two points designated, measure exactly half the distance, and draw a line from the centre of the circle to the middle of the board described. This divides in half exactly the enclosed segment. From the two points marked "X" in the diagram, measure back 4 inches towards the centre, inside the inner circle, and 8 inches beyond the outer. Take a piece of 1-inch board, 8 inches wide, 10 feet long. Saw down the middle and lay the pieces as indicated. Nail lightly to the floor, and with the scratching-nails mark out the curves as shown. This makes one pattern each for the inner and outer forms. Two of these must be joined to make a full section one-sixth the circumference. The strips used in holding the two parts together should be at least 4 feet long, and cut on the same circle as the form. Make the forms 3 feet or 3 feet 6 inches high, and cut six pieces from the pattern for each section of the form. This means thirty-six inner and thirty-six outer pieces. Use 2- by 4-inch material to join the pieces together as required. Cover each section with sheet iron or matched lumber. As shown in the diagram, the patterns are sawn in the line leading to the centre, so that they will fit in a circle. When complete, set up and bolt together in a circle, placing the inside form first. Bolt through the ends of forms, and by means of short pieces on top. To keep the inside form just 6 inches from the outside form, make several pieces 6 inches long for spacers. Place these 4 or 5 feet apart. The cost of forms for a silo 13 feet in diameter should not exceed \$40.

MIXING THE CONCRETE.

The concrete should be prepared on a smooth water-tight mixing-board, about 10 by 12 feet in size. A suitable mixture for silo-construction is one part cement, two parts sand, and four parts coarse gravel, commonly known as one to six. The most convenient method of measuring is by means of the bottomless box. The gravel or stone used should be clean and free from any foreign substances which would destroy the action of the cement. After adding the cement to the gravel and sand, mix thoroughly by shovelling, then add sufficient water and shovel again back and forth at least three times. Concrete hardens rapidly, and should not stand long after the cement is wet without being placed. The manner of handling is of great importance when placing concrete, for the materials must not separate when poured, as good concrete is obtained only when the stones and gravel remain in contact with the mortar. Avoid pouring from a height on this account, and have the mixture wet enough to be handled without breaking apart. To prevent cavities, place a layer about 1 foot deep in the forms, and then tamp or puddle with a flat spade or sharpened board. By working the spade along the sides of the form until the water rises on top, a smooth surface will be secured. The upper surface should be irregular to make a stronger bond with the next layer, and if the second be poured before the previous one

has thoroughly set it will give additional strength. A little dry cement sprinkled upon the surface before pouring is also a great aid in obtaining a good connection.

MATERIAL FOR ONE CUBIC YARD OF CONCRETE.

	Mixture. 1-2-4.	Mixture. 1-2½-5.
Barrels cement per cubic yard concrete	1.3	1.07
Cubic yards sand per cubic yard concrete	.42	.44
Cubic yards stone per cubic yard concrete	.84	.88

COST PER FOOT IN HEIGHT OF SILOS.

Mixture, one part cement, two and one-half parts sand, five parts gravel. Wall, 6 inches thick.

Diameter.	Cement. Barrels.	Sand. Cubic Yards.	Gravel. Cubic Yards.
10	0.65	0.260	0.538
12	0.778	0.32	0.642
14	0.903	0.372	0.74
16	1.03	0.422	0.844

To determine the amount of material necessary for any silo, multiply the figures given after the diameter by the desired height, thus:—

A silo 14 feet in diameter and 30 feet high requires—

Cement $0.903 \times 30 = 27.09$ barrels.

Sand $0.372 \times 30 = 11.16$ cubic yards.

Gravel $0.74 \times 30 = 22.2$ " "

Then multiply the amount of material by the prices. The above figures make allowance for neither foundation nor floor, but the previous table will assist in determining the cost of these.

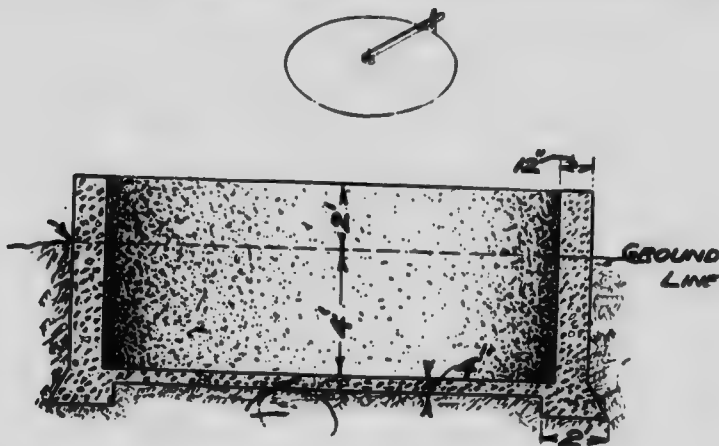
FOUNDATION.

The foundation should be such that no possibility of settling occurs. A firm sandy loam is the best soil on which to build, and then a clay. Mucky swamp soils are to be avoided; but if they have to be utilized, extra precautions should be taken.

These directions for the laying-out of a foundation will apply to any kind of silo, though, in the case of a stave silo, a foundation wall of solid concrete is not as necessary owing to its having to support less weight. A foundation of broken stone should, however, have a cement surface, and the inside should also be lined with cement if the sludge is to come into contact with it.

On the selected site, lay out a circle of a size at least 12 inches greater than the required inside diameter. Drive in a stake with a large nail on the top. Prepare a sweep with a hole in one end to fit over the nail, and a sharp pointed stick 6 inches farther from the nail than half the diameter of the silo. Keeping the sweep true by means of a level, draw a circle. Excavate within

the circle to a depth of $4\frac{1}{2}$ feet, keeping the wall sloping slightly outwards and leaving the bottom level. Then mark off another circle the exact size of the inner diameter, using the same centre. Drive stakes with their outer edge



(Fig. 3.) Foundation.

on this circle around it, about 2 feet apart, and brace them from the middle. Then bend thin boards around the outside of these stakes. This constitutes the inner form for the foundation, the earth wall being the outer. Before completing this, cut under the bank all around to give footing to the foundation, as shown in figure. A tile drain around the outside of the footing would remove any water that might accumulate. When the foundation-walls are completed, the bottom must be laid. Put down a solid layer of gravel 6 inches thick, and upon this put from 4 to 6 inches of concrete.

WALL.

The forms are first to be set in place, ready to receive concrete. The thickness of wall should not be less than 6 inches, and the forms described are suited to this. It is impossible to give very definite directions for the erection of staging when elevating the forms. The accompanying illustration may be of use, but it sometimes will be wise to obtain the assistance of a mechanic when commencing. Scaffolding is necessary both inside and out to



(Fig. 4.) Forms detached from first course above foundation.

support the forms. The sections when in place are bolted together as provided for during their construction. This holds them rigid. The first section of the wall will be built with the forms resting on the foundation, the inner one being barely on the inner edge of the foundation, so that the inside wall of the silo will be perpendicular from the bottom up. To keep the walls so



(Fig. 5.) Showing method of erecting staging.

throughout after the first section has been laid, allow the forms to lap back on the solid concrete at least 6 inches at each raising. For raising the forms and hoisting the concrete, block and tackle is necessary. When the forms are removed each time, smooth down both surfaces with a board, and when the silo is completed, go over the inner surface with a thin coat made of one part cement to one part sand, applying it with a whitewash brush. Keep the inner surface wet for a week, and a smooth and lasting surface will result.

REINFORCEMENT.

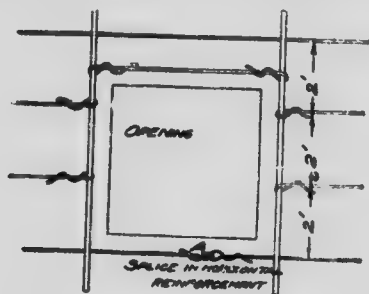
Different shapes of iron and steel are used in reinforced-concrete construction. For silo-construction wire is very satisfactory, as it offers a rough surface where wires are twisted together to form a cable, and laid as a continuous band in the concrete. Three-eighths of an inch steel rods may be used, but are more suitable for vertical reinforcement. Wire, to be fit for this purpose, should approach $\frac{1}{8}$ inch in diameter, and be of good material and not old.

Pour about 1 foot of concrete into the forms all the way round, then lay in the reinforcement about 2 inches from the outside of the wall. The size of the cable needed can be determined by the table given below. If rods are used, the ends must be firmly hooked together.

AMOUNT OF HORIZONTAL REINFORCEMENT NEEDED FOR SILOS.

Distance in Feet from Top of Silo.	Silos up to 16 Feet Diameter.		Silos up to 16 Feet Diameter.	
	No. of Wires in Cable.	Distance apart of Cable.	No. of Rods.	Distance apart of Rods.
5	2	12	1	18
5-10	2	10	1	18
10-15	2	8	1	14
15-20	4	8	1	12
20-25	4	6	1	10
25-30	4	6	1	8
30-35	5	6	1	6
35-40	5	4	1	4

Silos 25 feet high, and 10 or fewer feet in diameter, are stated to need no vertical reinforcement except around the door openings. It is, however, a safe plan to place rods, iron or steel, 3 feet apart vertically around the silo. Short lengths, 3 or 4 feet long, with the ends bent into hooks to join them, are found convenient. On either side of the doors vertical reinforcement must be placed and joined by twisting with the horizontal reinforcement.



(Fig. 6.) Reinforcement around doors.

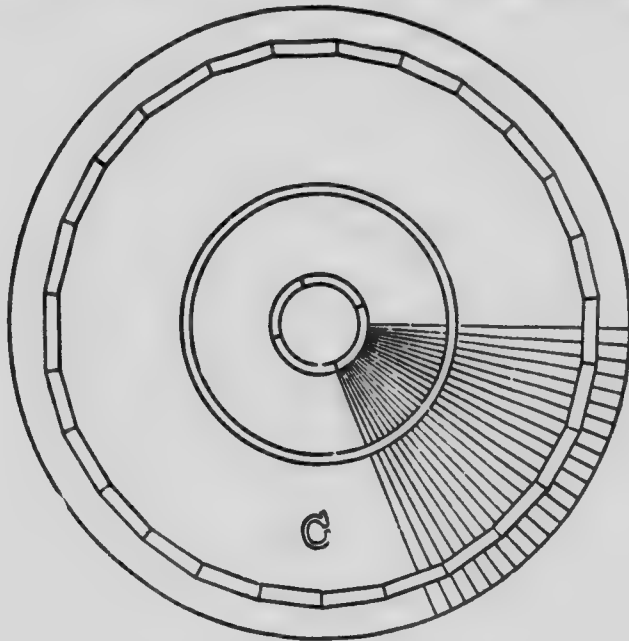
DOORS.

To construct a door-form, make a frame of 2- by 4-inch lumber, 2 feet wide by 2 feet 6 inches high. Then take pieces of 1-inch by 6-inch lumber, and

nail flatwise to this frame. This will provide a jamb of 1 inch when the form is removed, and if pieces of 2-inch stuff are placed flush with the front of the frame, it will give a 2-inch shoulder. This form should be deep enough to fit closely between the inside and outside form of the silo-moulds. The doors are double, of one-inch material, with tar-paper between, and are made carefully to have air-tight joints. The door openings should be no more than 4 feet apart. The doors are held in their places by cross-pieces of 2- by 4-inch material. When fitting doors, before filling any silo, if a layer of tar or building paper be placed between the jambs and the jambs and the doors, it excludes the air.

ROOF.

The roofs of cylindrical silos may be made in several ways, but the simplest of construction, and the one requiring the least amount of material, is that represented in Fig. 7, which is the cone. If the silo is not larger



(Fig. 7.) Cone-shaped roof.

than 15 feet in diameter, no rafters need be used, and only one hoop besides the circle in the centre. This circle is made of 2-inch stuff, cut in sections in the form of a circle, and two layers spiked together breaking joints.

The roof-boards are put on by nailing them to the inner circle, and to the plate as shown in the drawing, the boards having been sawn diagonally, making the wide and narrow ends the same relative widths as the circumference of the outer edge of the roof and of the inner circle. If the inside diameter exceeds 15 feet, use two or three hoops, according to diameter. If over 18 feet, use rafters. Prepared roofings are preferred to shingles for a silo-roof, as they make a tighter roof, which retains the heat in winter. Leave

a door in the roof through which to fill the silo. If it is not judged advisable to expend either material or labour in the construction of such a roof, a covering of slanting boards should at least be erected.

THE PLASTERED SILO.

The plastered or Gurler silo is adapted to localities where a supply of native lumber can be had, which furnishes a cheap building material. It may be built entirely from ordinary lumber, requires in its construction no highly skilled labour, is said to preserve the silage as well as any type of silo in use, and when properly made is strong and durable.



(Fig. 8.) Sill of 2- by 4-inch lumber on foundation wall.

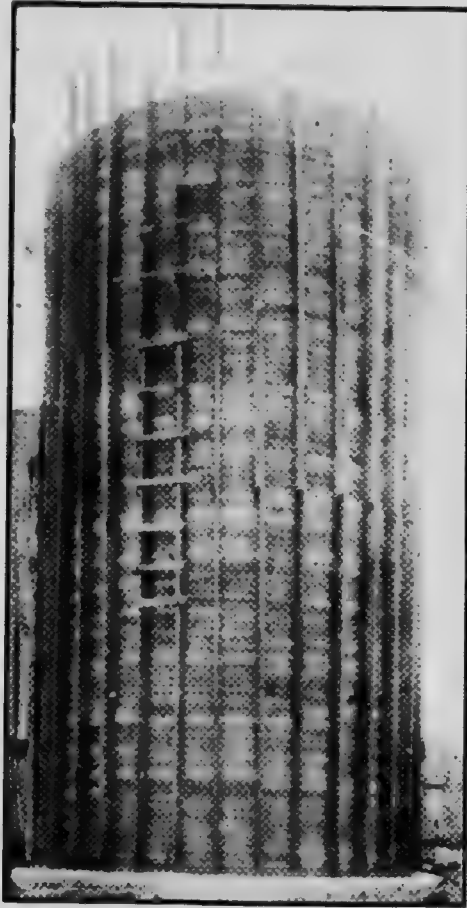
A sill should be placed on the top of the foundation-wall. This is made of 2- by 4-inch lumber, cut into 2-foot lengths. Each piece is put into place while the concrete is soft, and anchored by three heavy spike nails or thin bolts with nuts and washers on their ends. This anchoring is necessary, and ties the woodwork of the silo firmly to the concrete.

ERECTING THE STUDDING.

The studs are made of two lengths of 2- by 4-inch lumber, spiked together at the middle, and are erected 2 feet apart unless the diameter and height of the silo are more than about 16 by 30 feet, when it is advisable either to use 2- by 6-inch lumber, or set the studding only 18 inches apart. Two pieces of 2- by 4-inch lumber spiked together to make a 4- by 4-inch are used as a centre pole to tie the studding to while they are being set up. Each separate stud is toe-nailed to the centre of a section of the sill. Only the lower half of the studding is put up first, the second piece being spiked on after the lower half of the silo is nearly complete and needs no bracing. The studding must be plumbed and tied in position.

SHEETING.

When the lower half of the studding has been tied in position, the sheeting, made by ripping 1- by 6-inch lumber, is nailed horizontally on the inside of the studding, breaking joints. The sheeting should be nailed on from the foundation to within a yard of the top of the studding, and then the lath put on.



(Fig. 9.) Plastered Silo before siding is put on.

LATH.

The same material as the sheeting ripped into 1½-inch widths, with the edges bevelled, is used for lath. These are nailed on top of the sheeting so as to break joints, covering cracks and leaving a suitable space for clinching or keying the mortar. If the laths have not bevelled edges, keep them slightly away from the sheeting to allow good keying-space.

UPPER HALF.

When the sheathing and lath have been put on to within about a yard of the top of the first length of studding, a platform may be laid to enable the workmen to erect the second half in the same manner as the first was put up. It is well to leave the centre piece resting on the concrete floor, and extend it by adding another piece. The second half of the studding should be spiked to the first with a lap of about 2 feet. After plumbing and tying in place, the sheathing and lath are put on, and finally after removing the platform the middle is completed. Care must be taken that no wide cracks are left.

PLASTERING.

The wall of the silo is plastered to a depth of about 1 inch, with a rich, well-mixed mortar or concrete made from three parts of sharp, clean, coarse sand, or finely crushed stone, and one part of good cement. The mortar should be about as thick as that used in plastering a house. By giving the cement lining a wash of cement once in two years, the lining is protected against wear and corrosion.

DOORS.

When the studding is being spliced for the erection of the upper half of the silo, care must be taken that the studding between which the doors are to come are not lapped, but are put end to end and tied together with a 6-foot piece of 2- by 4-inch spiked to each at the juncture. This allows a door-jamb, which is simply another 2- by 4-inch set back from the inside edge of the stud $1\frac{1}{2}$ inches and either well spiked or bolted into place. The upper and lower jambs of the door are made from short lengths of 2- by 4-inch spiked across at the proper places. The doors may be made from flooring-boards nailed together at right angles, with a sheet or two of tar-paper between.

SIDING.

Put hoops on the silo and nail lumber to them. The hoops are made of three thicknesses of the sheathing lumber put around the silo every 4 feet. Put on one thickness at a time, breaking joints to ensure strength, and be careful not to cross doors. Nail the lumber vertically and cover the cracks with strips.

ROOF.

The roof most easy of construction is that given for a concrete silo, but a plate similar to the lower sill on this must be put around on the top of the studding. Provide for a circulation of air through the wall to prevent decay of the woodwork.

BRACING.

Anchor the silo firmly with four strong guy-wires, not too long.

THE STAVE SILO.

THE STAVES.

Hemlock and spruce are very suitable for staves. They may be of 2- by 4-inch or 2- by 6-inch scantling, or they may be from $1\frac{1}{2}$ to 3 inches thick, and from 5 to 9 inches wide; but 2- by 6-inch material, with at least one side and the edges dressed, is preferable, especially for the larger silos. A slight bevel may be given the ends with advantage, except in the

case of silos of large diameter, when the edges are best sized square. Staves with a tongue and shallow groove are more easily kept in place. Great care must be taken to have the lumber well sized and free from knots or shaky spots.

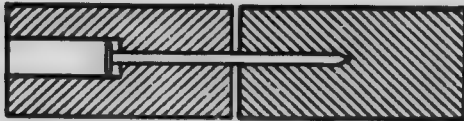


(Fig. 10.) Stave with tongue and groove.

After the staves are squared at the ends, holes should be bored in the edges, from 4 to 6 feet apart, with a $\frac{1}{2}$ -inch bit, on one side of each stave only, and not in line in adjoining staves. They should be of the depth of 1 inch in staves 4 inches wide, and about $2\frac{1}{2}$ inches deep in staves 6 inches wide. One of these holes should come within a foot or less of each end of the stave. Bore the holes at right angles to the edge of the stave to avoid throwing the silo out of plumb. Spikes are driven through the holes into the adjoining stave. Avoid those portions of staves to be cut out for doors.

SPLICING.

It will often be necessary to make the staves of two different pieces. The ends should be carefully squared, and by making a saw-cut an inch or so deep, and inserting a bit of heavy hoop-iron, a good splice is secured. Break the joints alternately towards the top and bottom of the silo.



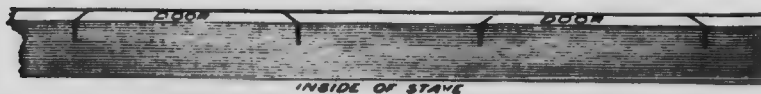
(Fig. 11.) Splicing staves together.



(Fig. 12.) Splicing stave.

THE DOOR-STAVE.

Before beginning the erection of the staves, decide how many doors the silo needs, that a door-stave may be prepared. When the number of doors

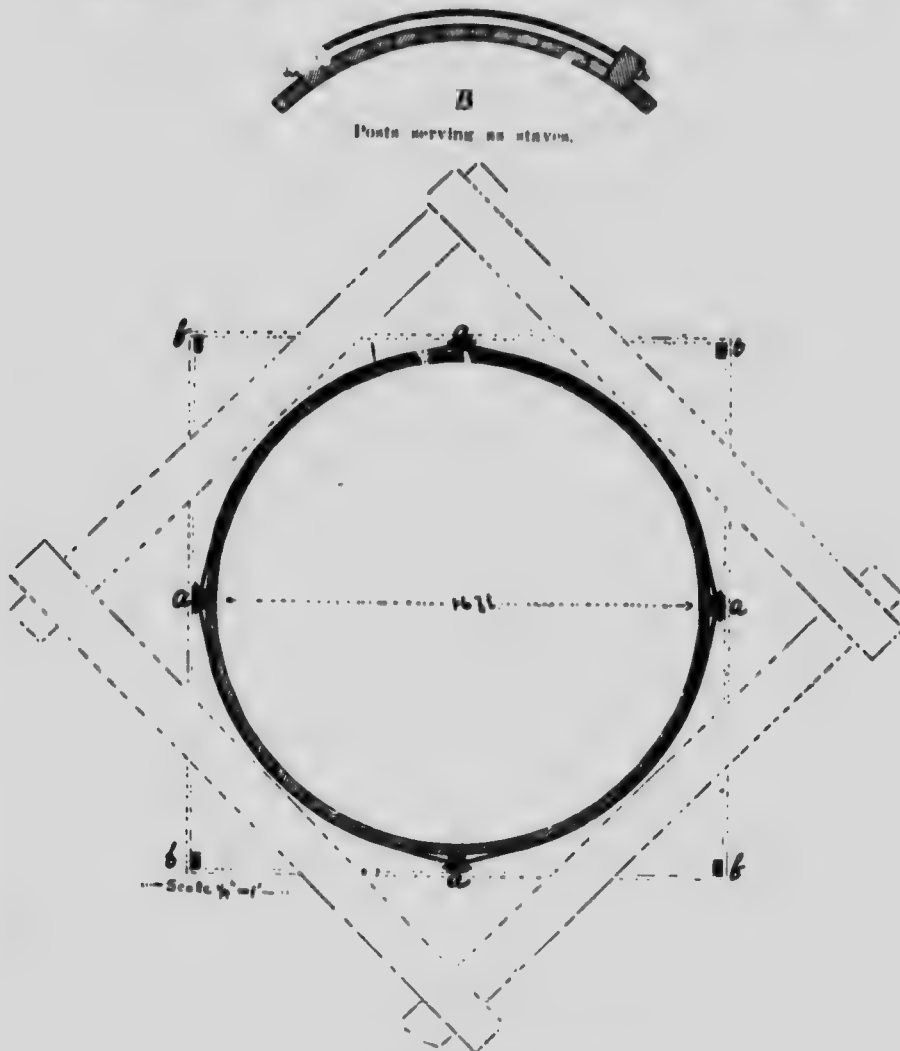


(Fig. 13.) The door-stave.

required and the distance between them is determined, lay off on a stave the exact location of the doors. Make saw-cuts half-way through to provide for the entrance of the saw when cutting out the doors after the staves are set up. The cuts should be made at an angle of 45 degrees on the edge of the stave, but horizontal on the front. To prevent this stave from breaking while it is being handled, nail a slot on one side of it.

SETTING UP THE SHED.

Figure 14 shows a method of erecting scaffolding from which to adjust and nail the staves. Four posts 6 by 6 inches, the desired height and



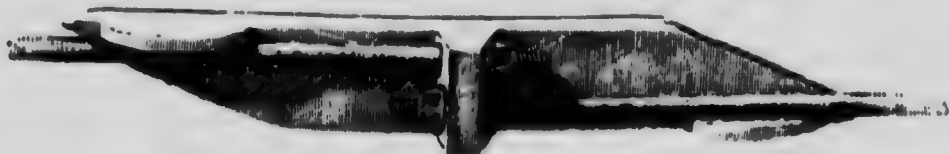
(Fig. 14.) Method of erecting scaffolding.

equidistant from each other, are erected on or 2 inches outside the circle traced on the cement. If set on the circle they will take the place of staves, and will in either case serve instead of clips or lugs for the hoops. Four other temporary posts of 2- by 4-inch material will be necessary, as indicated in figure.

As the erection of staves proceeds, carefully plumb them in both directions, and nail each to its neighbour through the holes bored for this purpose.

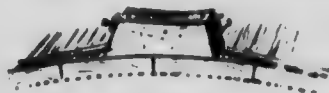
Hoops.

Round hoops made from $\frac{3}{4}$ -inch iron or steel rods are commonly used. When the posts are made use of for joining the hoops, each hoop is composed of two, three, or four sections threaded for several inches at both ends for the nuts and washers. Joining by means of lugs or clips, as in Figs. 15 and 16, is to be preferred to the post method, and in this case a hoop continuous around the silo is employed. Place two hoops below the lowest door, the first close to the bottom, the second 18 inches or so above. Gradually increase



(Fig. 15.) Lug for hoops.

the space between them until it amounts to about $3\frac{1}{2}$ feet at the top. Staples should be driven over each hoop at intervals, to hold it in position if it becomes loose. Let each stave be so attached to at least two hoops. The hoops must be drawn tight enough before filling to close up the spaces between



(Fig. 16.) Clip for hoops.

the staves, and prevent foreign matter entering, but not perfectly tight. Watch closely for a few days after filling, and if the strain becomes intense, loosen slightly.

Roof.

When the silo is built outside it is well to roof it. Bracing the silo by means of guy-wires will make it secure in windy weather.

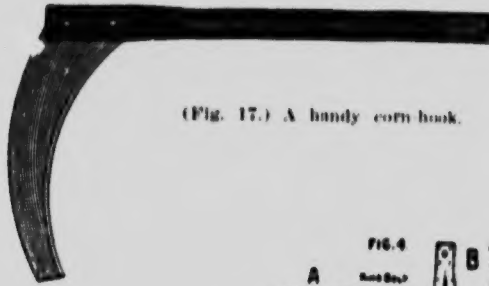
CUTTING AND DRAWING IN THE CORN.

For cutting the corn, the hook in Fig. 17 will be found very convenient. When drawing in, a low platform wagon is useful. The illustrations given in Fig. 18 show how it is constructed.

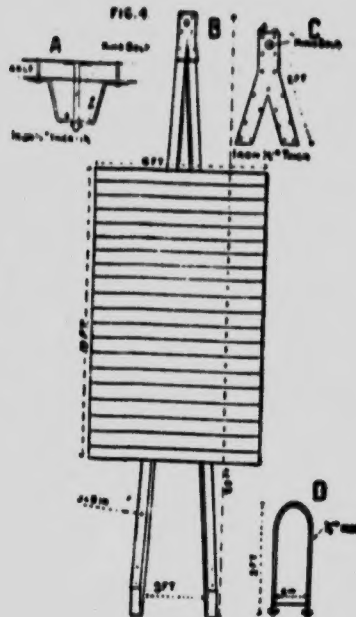
FILLING THE SILO.

When filling the silo, it is recommended to have the material, as it falls from the carrier or blower, descend through a tube made of sacks with the bottoms out. This allows a more thorough mixing of stems and leaves than when other means are used to keep the surface level. Fill the silo, packing the silage evenly in all parts, allow the mass to settle, then fill again, and

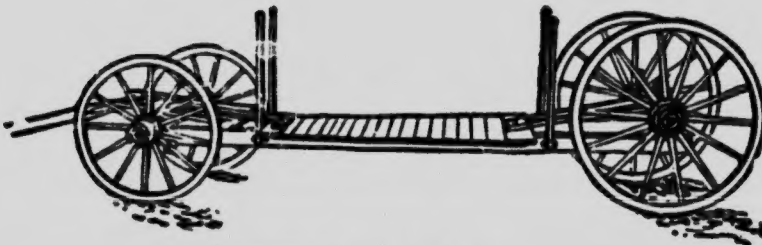
continue these operations as long as possible. No pressure is required, nor is any cover absolutely necessary on the surface of the silage. A layer of partly damaged silage 2 or 3 inches thick soon forms, and, being impervious to the air, it protects the rest. Some cover the surface with chaff which they wet, and others further sow oats on this layer. These methods effect a small saving of silage.



(Fig. 17.) A handy corn hook.



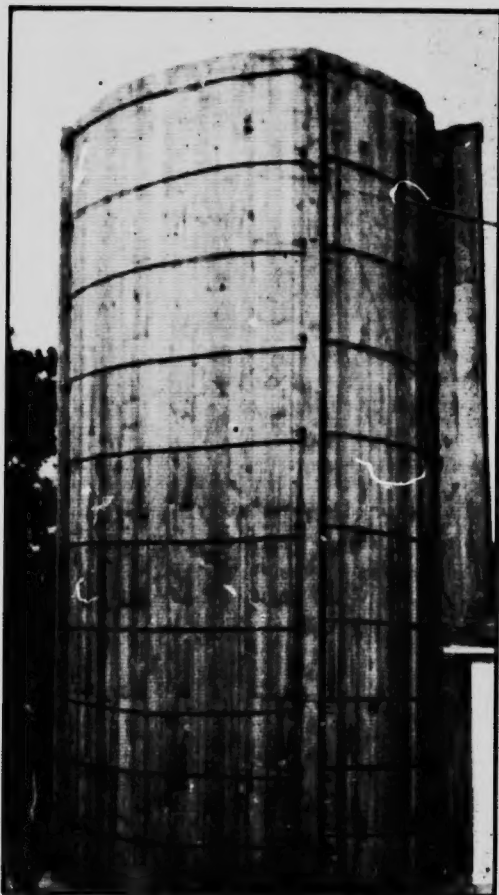
(Fig. 18.)



Low platform wagon for hauling corn.

CROPS FOR ENSILAGE.

If it is desired to ensilage crops other than corn, particularly leguminous ones, it must be remembered that these do not undergo the same kind of fermentation owing to the different albuminoid content. The odours are more unpleasant, and it appears harder to preserve these plants in this way than to preserve corn. On this account great care should be taken to pack so as to exclude air.



(Fig. 19.) Stave Silo with posts instead of lugs.

Professor Thomas Shaw, in his work on "Soiling Crops and the Silo," states that, in the order named, the following crops are suitable for conversion into silage: Corn, sorghum, leguminous plants other than clover, plants of the clover family, millets, the common cereals. Silage made from the field-pea or the common vetch alone, without mixing with other crops, too often is very acid in character, decomposed, and off in colour and smell. Horse-beans mixed with corn in the silo gave good results at Ottawa, increasing

the protein content of the silage. Where much rain falls in haying-time, clover may be profitably put into the silo, but it gives better results if in a mixture and preferably with corn. The millets, preserved alone or unmixed in the silo, have not as yet proved a decided success. The common cereals, wheat, oats, rye, and barley, are not readily preserved in the silo owing to the hollow and dry character of the stems, and silage made from these crops is liable to injury from dry mould, though tramping and wetting while the silo is being filled lessens the liability to injury in this manner. The cereals can, however, usually be readily cured as hay when wanted in that form, and there is generally less risk in so curing them.

**BULLETINS AT PRESENT AVAILABLE FOR DISTRIBUTION BY THE
DEPARTMENT OF AGRICULTURE.**

-
- No. 7.—Flax.
.. 8.—Feeding Farm Animals.
.. 20.—Varieties of Fruit recommended.
.. 25.—Orchard Cleansing.
.. 28.—Production of Eggs.
.. 30.—Guide to Bee-keeping.
.. 32.—Bovine Tuberculosis.
.. 34.—Fruit-trees and Black-spot Canker.
.. 35.—The Place and Purpose of Family Life.
.. 36.—The Preparation of Food.
.. 37.—The Preservation of Food.
.. 38.—Construction of Silos.

Applications for bulletins should be addressed to the Secretary, Department of Agriculture, Victoria, B.C.

VICTORIA, B.C.:

Printed by WILLIAM H. CULLIN, Printer to the King's Most Excellent Majesty.
1912.